IRIDIS
ALPHA
THEORY

ROBERT HOGAN

Foreword

There used to be a time when video game enthusiasts could only experience the very best in places called "arcades".

In the early '90s, 16-bit home consoles such as the Super Nintendo, the Sega Genesis, or the NEC PC Engine were ramping up in terms of horsepower. However, they were a far cry from the hardware found in coin-operated "Amusement Machines".

Nicknamed "coin-ops", these cabinets ran video games featuring multitudes of huge sprites covering the whole screen, beautiful colors, digitized sounds, and engaging high quality music. These machines were in a league of their own.

Accessing arcades was an adventure in itself. Quarters had to be gathered, means of transportation acquired, and paper maps studied. Some carpooled while others used their bikes. Lucky ones had "amusement venues" dedicated to video games in their hometown while others found themselves in a dirty pub surrounded by adults who did not seem to have much magic happening in their lives.

Amount of play time was directly correlated with skill level. Coins were spent carefully, after having studied other people's techniques. The only certainty resulting from the expedition was a day ending with empty pockets.

Despite all these obstacles, video game connoisseurs found the attraction irresistible. Players of all ages and origins gravitated to the same places in order to follow their passion.

Rows of lined up cabinets created a highly competitive environment where publishers only had a few seconds to catch a player's attention and, most importantly, their quarters. It was during this time that a young company named Capcom managed to rise above the competition, seemingly producing one masterpiece after another, and turn itself into an icon.

The history of Capcom and the genesis of Street Fighter II, Ghouls 'n Ghosts, and Final Fight belongs in history books. Unfortunately when I started researching the topic, I found little to satisfy my curiosity and next to nothing about the engineering side of things.

The fierce rivalry between publishers warranted extreme secrecy. Artists, programmers, and designers were only credited with their nicknames in order to avoid poaching. As for the hardware powering Capcom's titles, nothing ever officially transpired except for a code name, **CP-System**.

This book attempts to shed some light on the mystery platform. It is an engineering love letter to the machine that enabled Capcom's tremendous success.

– Fabien Sanglard
Occasional Link to the Past

Sunnyvale, CA
December, 2022

Contents

Making Planets for Nigel

> 17 February 1986 Redid the graphics completely, came up with some really nice looking metallic planet structures that I'll probably stick with. Started to write the GenPlan routine that'll generate random planets at will. Good to have a C64 that can generate planets in its spare time. Wrote pulsation routines for the colours; looks well good with some of the planet structures. The metallic look seems to be 'in' at the moment so this first planet will go down well. There will be five planet surface types in all, I reckon, probably do one with grass and sea a bit like 'Sheep in Space', cos I did like that one. It'll be nice to have completely different planet surfaces in top and bottom of the screen. The neat thing is that all the surfaces have the same basic structures, all I do is fit different graphics around each one.
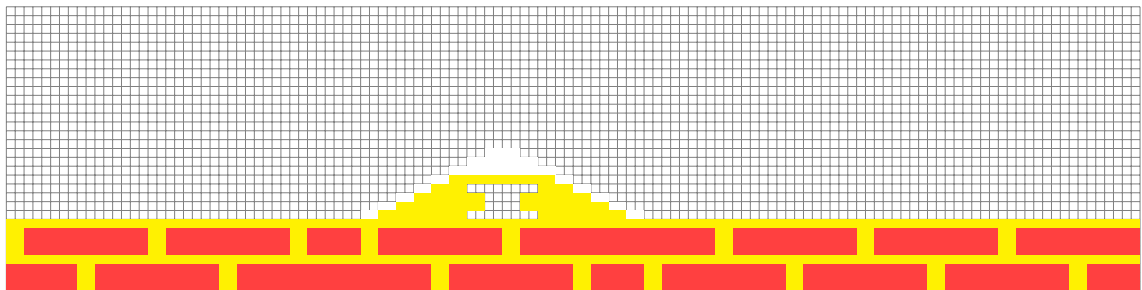>
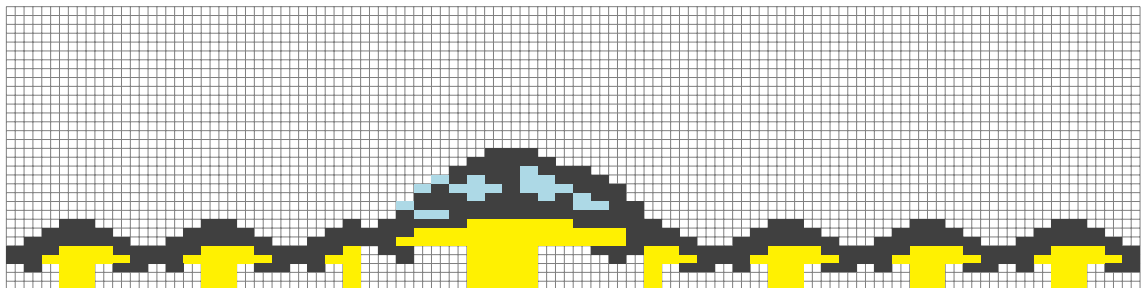> — Jeff Minter's Development Diary in Zzap Magazine[2]
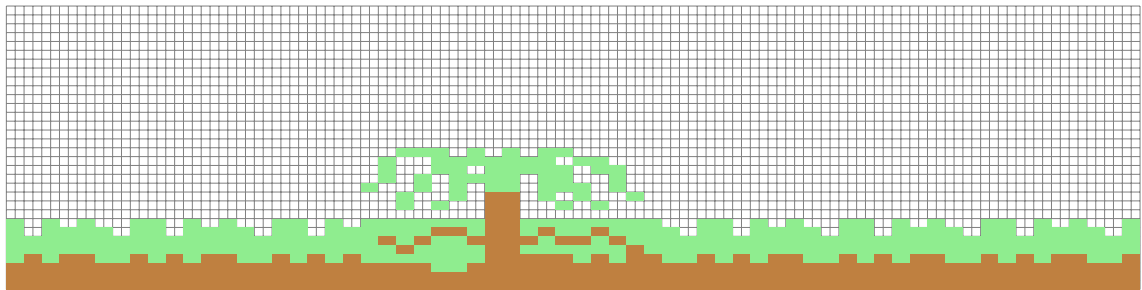
Figure 1.1: planet1Charset mediumStructureData
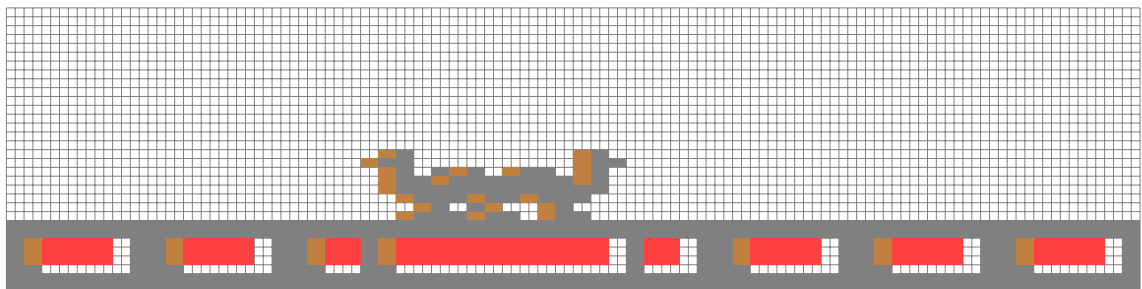
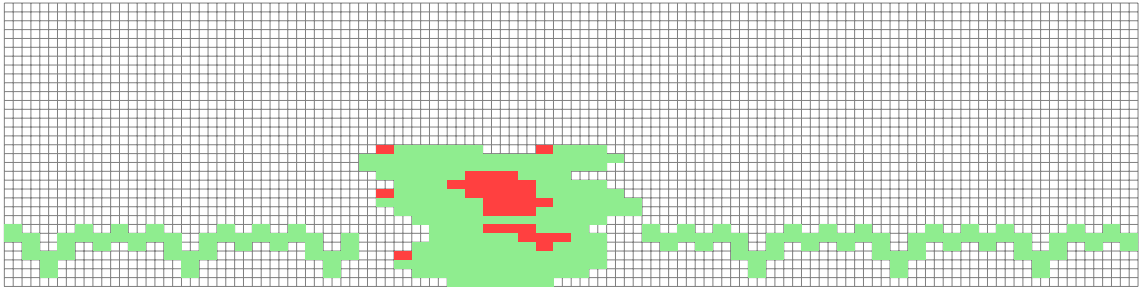**Figure 1.2:** planet2Charset mediumStructureData

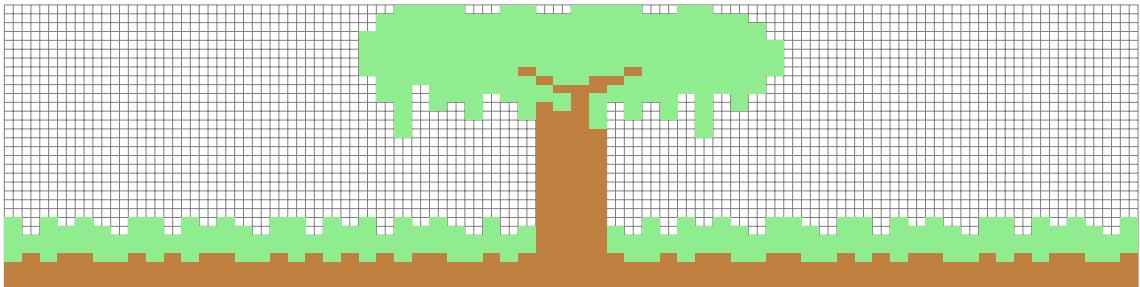**Figure 1.3:** planet3Charset mediumStructureData

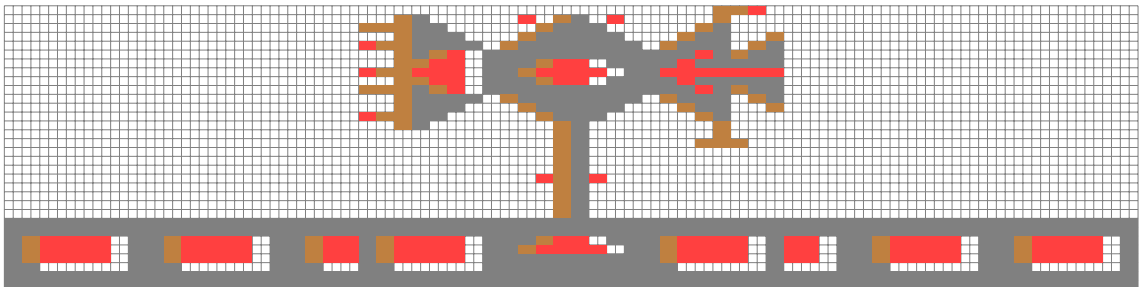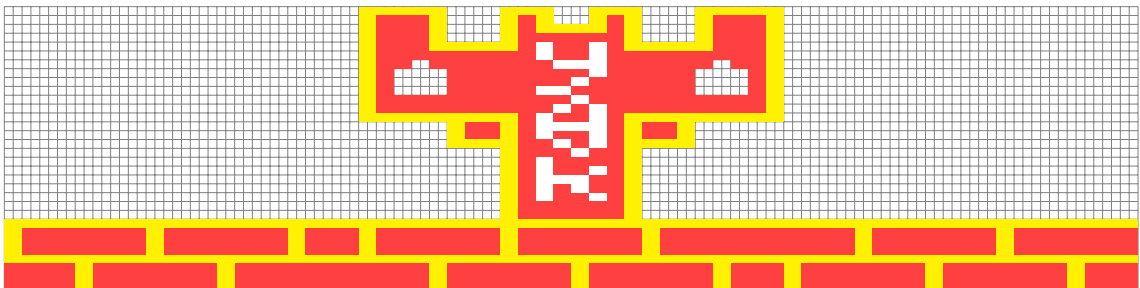**Figure 1.4:** planet4Charset mediumStructureData

Figure 1.5: planet5Charset mediumStructureData
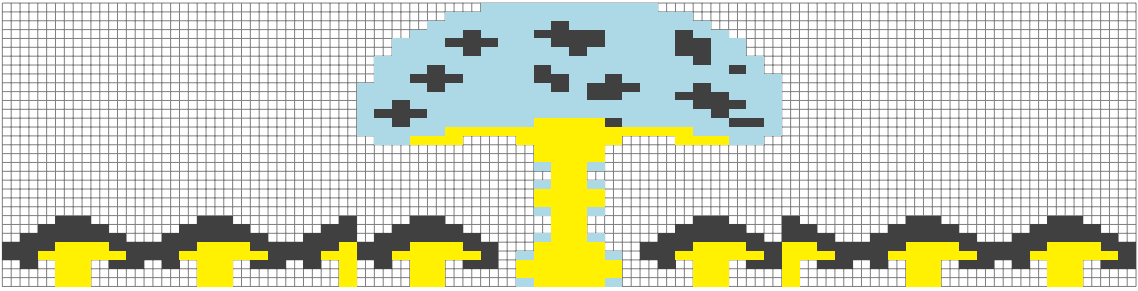

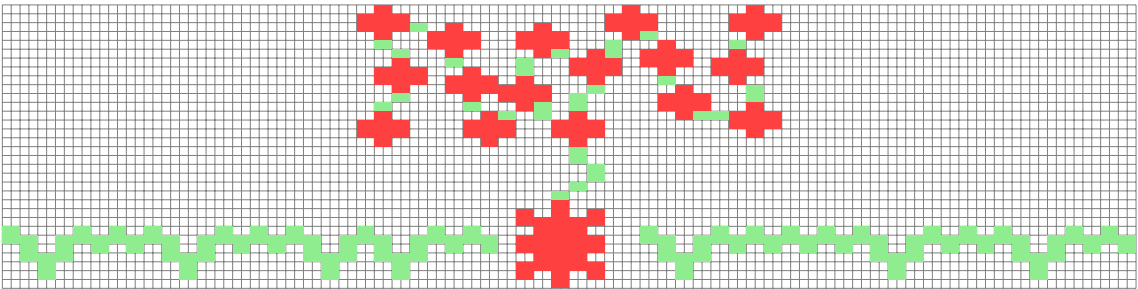**Figure 1.6:** planet1Charset largestStructureData

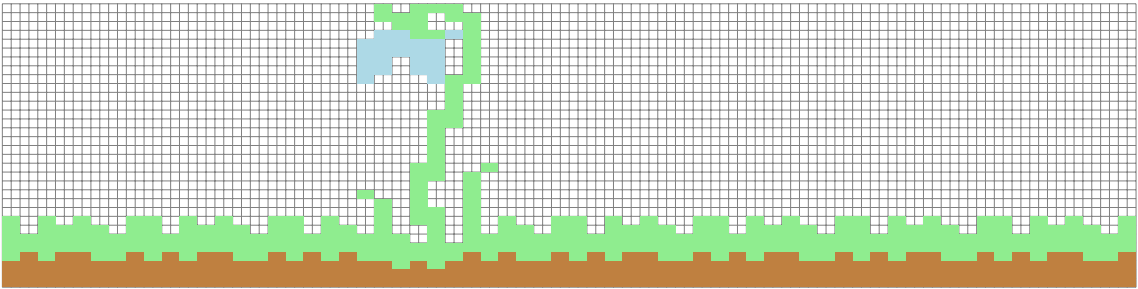**Figure 1.7:** planet2Charset largestStructureData

Figure 1.8: planet3Charset largestStructureData

Figure 1.9: planet4Charset largestStructureData
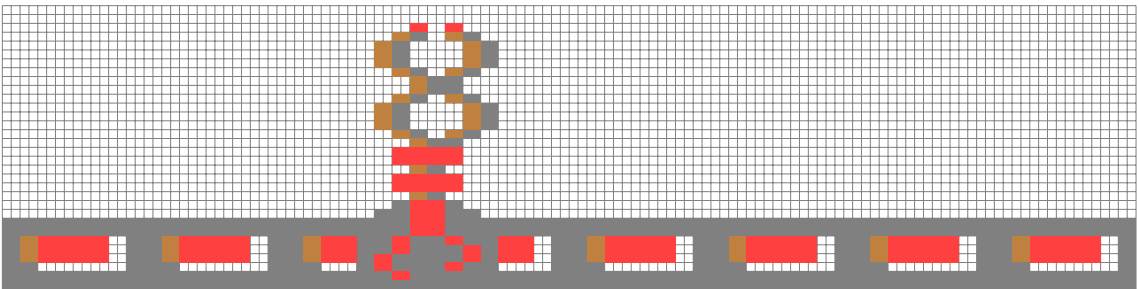

Figure 1.10: planet5Charset largestStructureData

Figure 1.11: planet1Charset nextLargestStructure

Figure 1.12: planet2Charset nextLargestStructure
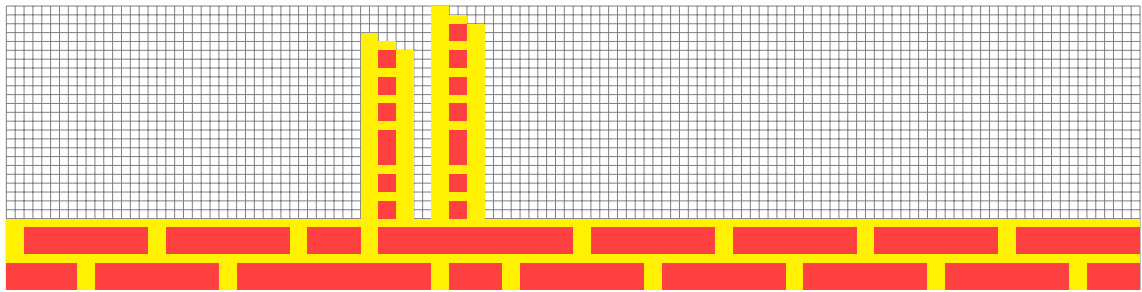
Figure 1.13: planet3Charset nextLargestStructure

Figure 1.14: planet4Charset nextLargestStructure
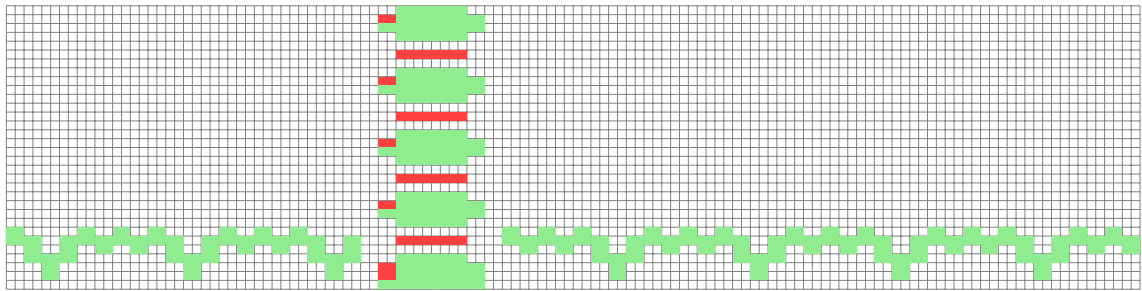
Figure 1.15: planet5Charset nextLargestStructure
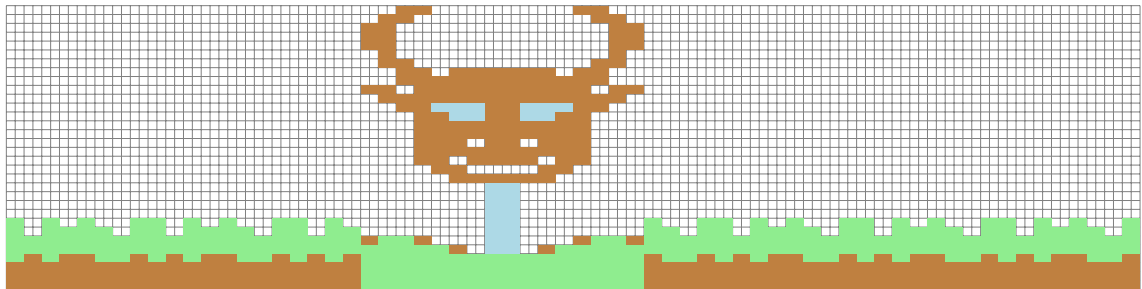
Figure 1.16: planet1Charset warpGateData

Figure 1.17: planet2Charset warpGateData

Figure 1.18: planet3Charset warpGateData

Figure 1.19: planet4Charset warpGateData

Figure 1.20: planet5Charset warpGateData

Figure 1.21: planet1Charset littleStructureData

Figure 1.22: planet2Charset littleStructureData

Figure 1.23: planet3Charset littleStructureData

Figure 1.24: planet4Charset littleStructureData
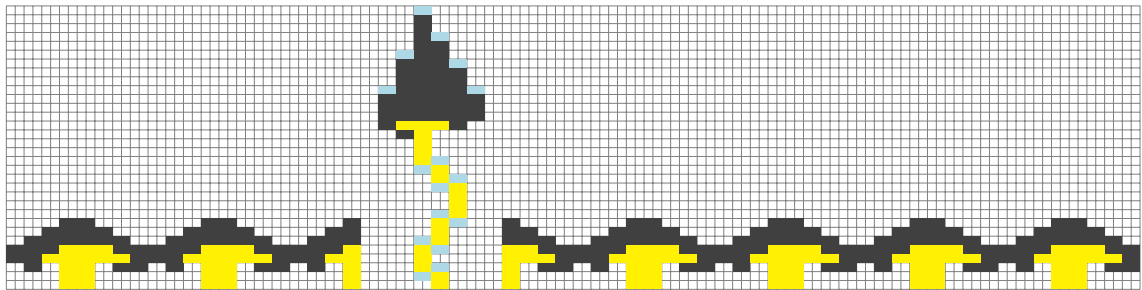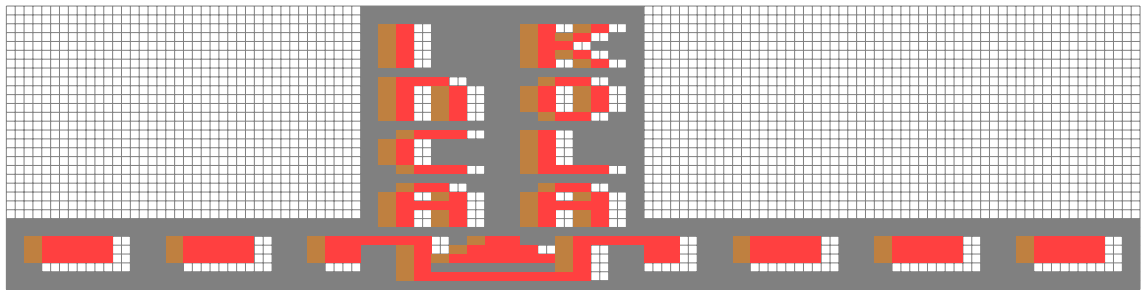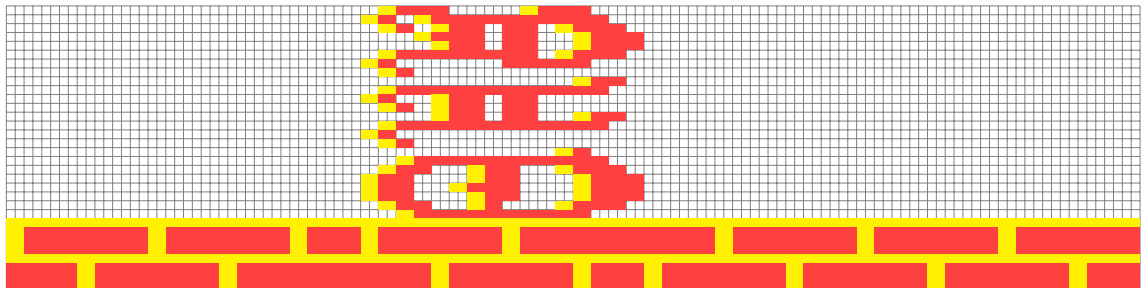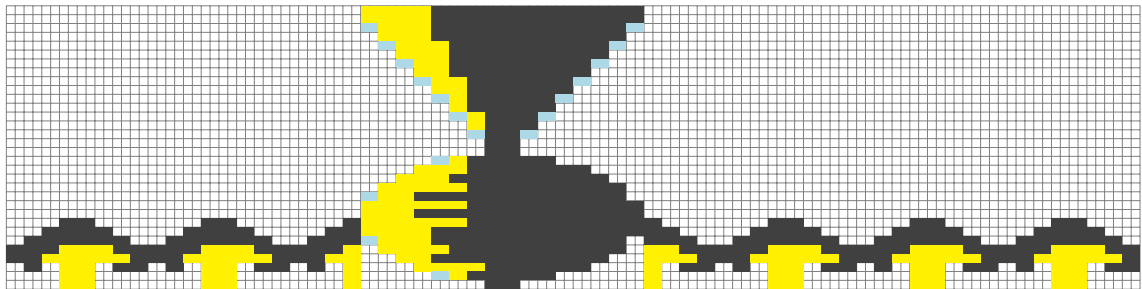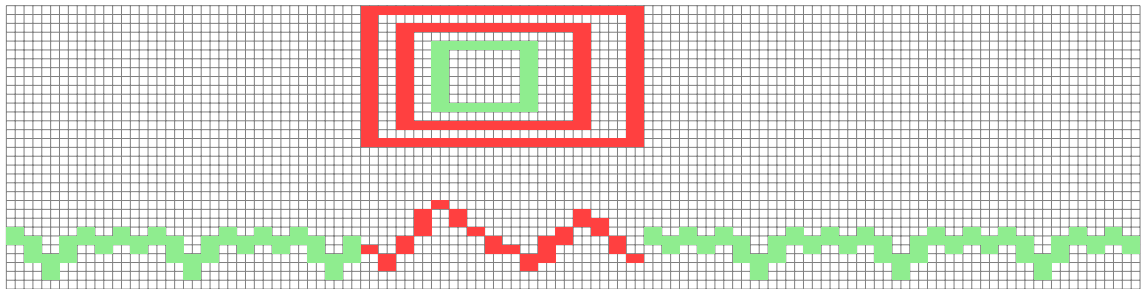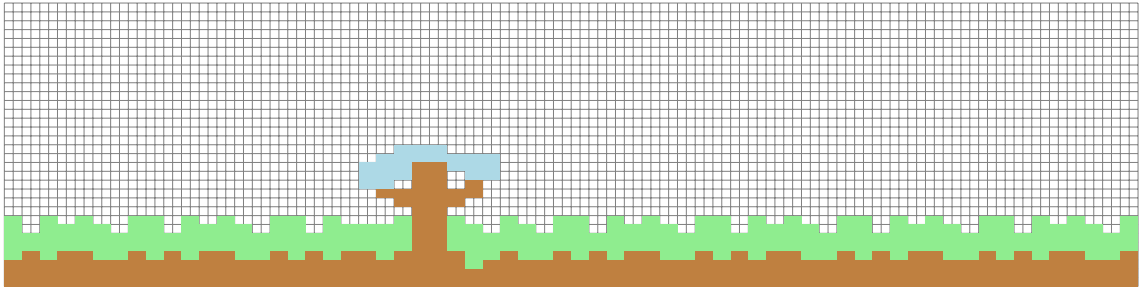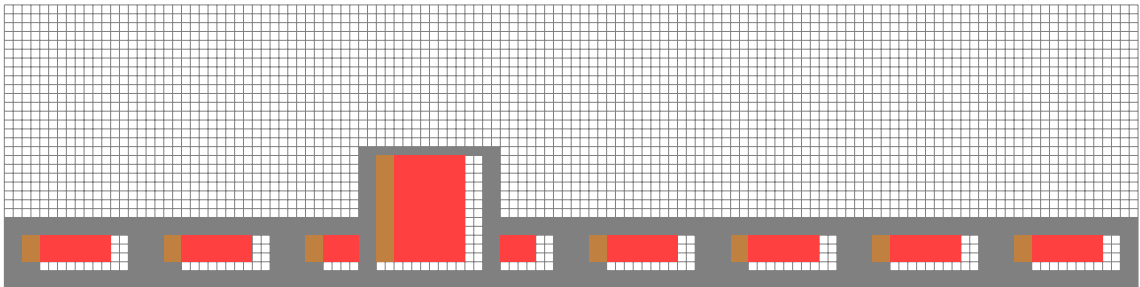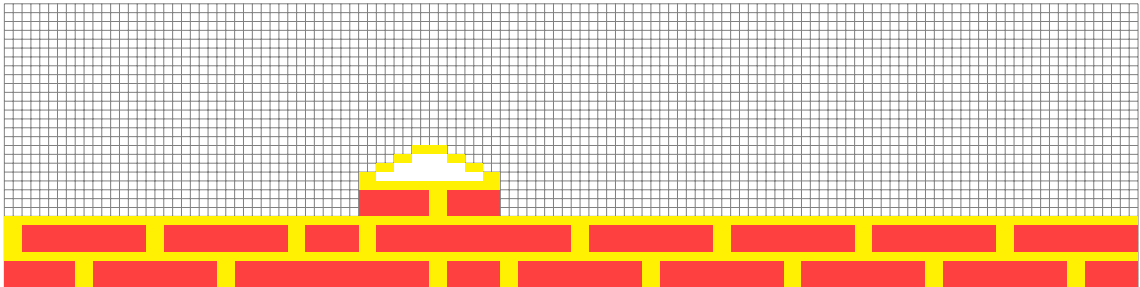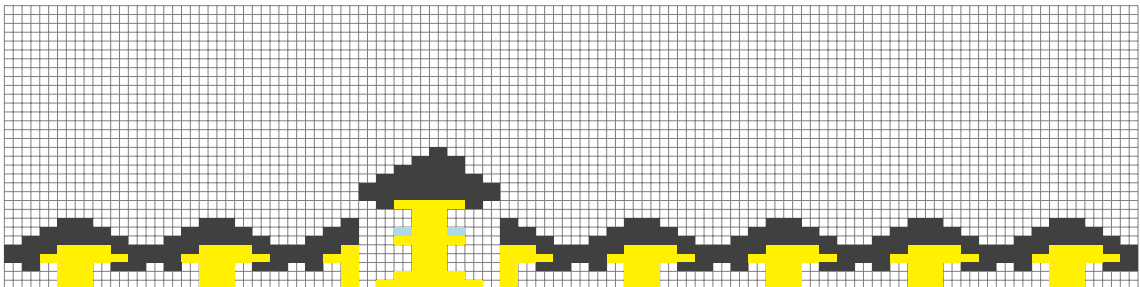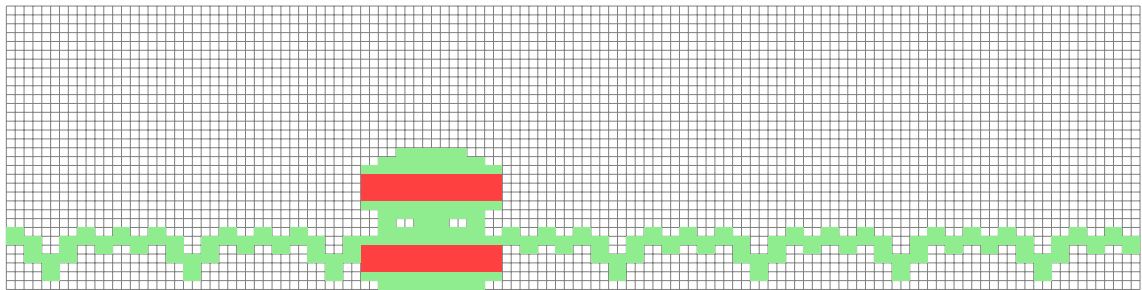
Figure 1.25: planet5Charset littleStructureData

Notes & References

[1] **What is a Medal game?** This is not a typo! A medal game is played with metal coins. The most famous ones are "pusher games" where the player must drops coins in a platform system. Each platform moves back and forth as automated brooms. The goal is to push coins groups past the edge of the final platform where they are rewarded to the player.

[2] **What is a Planner?** They were the top decision maker in a Japanese game dev team. Responsible for giving directions and making game design decisions, all other members of the team reported to them. There was usually a single Planner in charge (like Poo on 1943: The Battle of Midway) but there could be two like in Street Fighter II where both Akira Nishitani (Nin) and Akira Yasuda (Akiman) were in charge.

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[16]　**"Mame CPS-1 driver"** (mame source code), link, 2008-04-11.

[17]　**"Kabuki z80 encryption"** (mame source code), link, 2008-04-11.

[18]　**"Early CAPCOM Arcade Games FGPA"** (Jose Tejada), link, 2020-08-05.

[19]　**"Genesis mode H40"** The vertical and horizontal rates in H40 are not the numbers we would get if we were to inject the dot-clock, number of dots, and number of lines in the formulas. This is because the Genesis designers wanted to have the same rate in H32 and H40 modes (59.92 Hz). The dot-clock slows down to 5.37MHz for 28 dots during HBLANK, resulting in 59.92 Hz VSYNC and 15,700 KHz HSYNC (Conversation with Upsilandre).

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[21]　**"Final Fight Developer's Interview"** (capcom.com), link, 2019-02-08.

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[24]　**"Capcom Activity Report: Akira Yasuda part 2"** (capcom.com), link, 2016-04-04.

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From the preface:

Before the era of overpowered PCs and home consoles, there was a time when video-game enthusiasts could only experience the very best and the most challenging in places called "arcades".

In these locations, players of all ages and origins gathered to take their passion to a level no consumer grade hardware could.

The arcades of the early '90s were a highly competitive environment where publishers only had a few seconds to catch a player's attention, and more importantly their quarters. It was during that time that a young company named Capcom managed to elevate itself above the competition and turn itself into an icon.

This book is an engineering love letter to the platform that allowed this metamorphosis. If you have always wanted to learn about the machine behind the legendary CPS-1 titles Street Fighter II, Ghouls 'n Ghosts, and Final Fight, the "Book of CP-System" is for you.

Inside, you will find the hardware of the CPS-1 described and explained in excruciating detail. The software is also covered with a fully detailed modern pipeline, turning code and assets into ROMs.

Jump in and discover a world of one hundred explanatory illustrations, sprinkled with typos and broken English to remind you this isn't just a dream!

From the same author:
- Game Engine Black Book: DOOM
- Game Engine Black Book: WOLF3D